Executive Summary

MARICOPA ASSOCIATION of GOVERNMENTS

MAG Non-Recurring Congestion Study

Traffic delays are caused by recurring and non-recurring events. Recurring congestion—when daily peak demand exceeds the roadway capacity—is regular, easily identifiable, and measurable. Non-recurring congestion (NRC) is generally random making its delay more difficult to identify, measure, and counteract. With NRC estimated to be as much as 70% of total congestion per national studies, there is a need to ascertain and mitigate its effects.

This study had two key objectives. The first was to identify and quantify NRC on both freeway and arterial systems in the MAG region relating to causes such as traffic incidents, construction, severe weather, special events, and signal control malfunctions. The second was to identify countermeasures to mitigate the impact of NRC.

For the freeways system assessment, travel times were obtained from 2009 sensor data along five freeway study sections. For the arterial system assessment, travel time data was obtained using *Bluetooth*™ matching technology along five arterial study sections. The difference in recurring and non-recurring travel times were determined to be NRC. Each NRC event was then classified by the causes.

Incidents and construction were the primary NRC causes on the study sections. NRC represented a significant portion of the regional congestion based on an extrapolation of the study data. Thus, the mitigation of NRC—focused on incident and construction countermeasures—is instrumental for improving traffic operations, reducing emissions, and deferring costly roadway capacity expansion.

ESSENTIAL FINDINGS

Table 1 shows the total weekday congestion as 54% recurring and 46% non-recurring on the freeway study sections while the weekend congestion was entirely due to non-recurring events. This meant there was no recurring congestion that exceeded a 15% threshold to account for variability in "normal" speeds on the weekends. This finding made sense because there was adequate roadway capacity during the weekend when there is very little commuter traffic on the freeway sections. Figure 1 shows the distribution of the NRC causes.

TABLE 1
Weekday & Weekend Recurring and Non-Recurring Freeway Congestion

FREEWAY STUDY SECTIONS	Recurring Congestion (veh-hrs)	Non-Recurring Congestion (veh-hrs)	Total (veh-hrs)	% NRC
Weekday Conditions (from 2009)				
I-10 WB: SR 51 to I-17	89,167	97,491	186,658	52%
I-17 SB: I-10 to I-10	2,874	13,822	16,696	83%
Loop 202 WB: 46th St to 22nd St	68,514	40,407	108,921	37%
I-10 WB: Ray to Southern Ave	140,080	39,324	179,404	22%
US 60 EB: I-10 to Loop 101	23,299	82,017	105,316	78%
Total for Weekday	**323,933**	**273,062**	**596,994**	**46%**
Weekend Conditions (from 2009)				
I-10 WB: SR 51 to I-17	-	2,097	2,097	100%
I-17 SB: I-10 to I-10	-	2,567	2,567	100%
Loop 202 WB: 46th St to 22nd St	-	2,741	2,741	100%
I-10 WB: Ray to Southern Ave	-	74	74	100%
US 60 EB: I-10 to Loop 101	-	18,167	18,167	100%
Total for Weekend	**-**	**25,645**	**25,645**	**100%**

The arterial study sections were comprised of primary segments and associated secondary segments. The primary segments consisted of the main study roadways: 35th Avenue, 51st Avenue, Indian School Road, 7th Street, and Rural Road. Table 2 summarizes the recurring congestion and NRC for each primary study section (with any associated secondary segments noted) for weekdays and weekends and Figure 2 shows the distribution of NRC causes.

Weekday and weekend non-recurring congestion was overwhelmingly due to vehicular incidents and construction for both freeways and arterial streets.

TABLE 2
Weekday & Weekend Recurring and Non-Recurring Congestion on Arterials

ARTERIAL STUDY SECTIONS	Recurring Congestion (veh-hrs)	Non-Recurring Congestion (veh-hrs)	Total (veh-hrs)	% NRC
Weekday Conditions (various durations in 2010)				
35th Ave Corridor (w/Bell Rd)	87,914	103,393	98,307	11%
51st Ave Corridor (w/T-Bird, Peoria & Northern)	84,024	3,250	87,274	4%
Indian School Rd Corridor	48,526	11,951	60,477	20%
7th St Corridor	53,701	6,087	59,788	10%
Rural Rd Corridor (w/Rio Salado, Mill & University)	72,882	1,404	74,286	2%
Total for Weekday	**347,047**	**33,085**	**380,132**	**9%**
Weekend Conditions (various durations in 2010)				
35th Ave Corridor (w/Bell Rd)	25,144	4,620	29,764	16%
51st Ave Corridor (w/T-Bird, Peoria & Northern)	27,618	2,133	29,751	7%
Indian School Rd Corridor	26,164	4,969	31,133	16%
7th St Corridor	15,901	5,906	21,807	27%
Rural Rd Corridor (w/Rio Salado, Mill & University)	30,167	4,397	34,564	13%
Total for Weekend	**124,994**	**22,025**	**147,019**	**15%**

FIGURE 1
Distribution of Weekday and Weekend NRC Causes on Freeway Study Sections

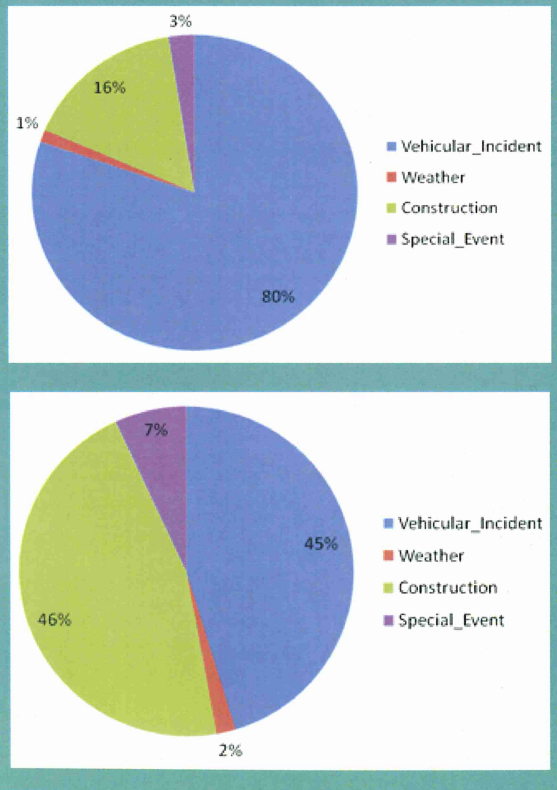
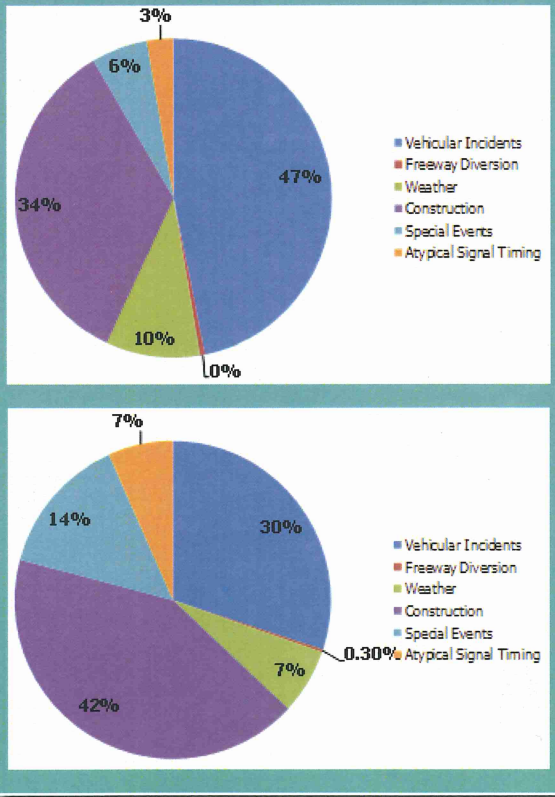


FIGURE 2
Distribution of the Weekday and Weekend NRC Causes on Arterial Study Sections



The next step in the assessment process was to expand the recurring and non-recurring congestion from the study sections to the rest of MAG region. The study found the extrapolated annual congestion from both freeways and arterials combined were as follows:

Total Congestion (recurring and non-recurring):

12% on freeways (10,584,875 veh-hrs)
88% on arterials (77,946,262 veh-hrs)

Non-Recurring Congestion Only:

38% on freeways (5,078,017 veh-hrs)
62% on arterials (8,340,250 veh-hrs)

The total congestion breakdowns provide very conservative estimates for congestion on arterials. The arterials comprise 73% of the region's lane miles and carry nearly two-thirds of all travel in the Phoenix region. The estimated recurring congestion on arterials include delays at intersections during normal undersaturated conditions. The estimated NRC on arterials are extrapolations based on observed NRC on study arterials that are some of the highest crash locations in the region.

For division between NRC and recurring congestion, the freeway study sections had 52% recurring congestion and 48% NRC. However, there was 89% recurring congestion and 11% NRC on the arterial study sections (arterials are expected to have high recurring congestion since stop delay at signalized intersections is included). For NRC only comparisons, the arterials accounted for 62% of the congestion and freeways comprised the remaining 38 percent. The results suggest that addressing congestion on arterials should be part of any regional congestion mitigation strategy, especially given the extensive arterial grid system in the Phoenix region.

RELEVANT COUNTERMEASURES

A cross-referencing of the study's literature review with local knowledge of the MAG region's traffic and operations characteristics, including NRC countermeasures already employed and input from the Study Advisory Group, generated multiple relevant possible countermeasures for freeway and/or arterial application. The following shortlist of countermeasures was developed and is presented in order of increasing cost/complexity within each roadway category.

Freeways

- Enhanced traffic incident management programs and strategies;
- Installation and monitoring of vehicle sensors, and dissemination of resulting traffic information;
- Improved information dissemination via existing permanent dynamic message signs (DMS);
- Enhanced ramp metering system;
- Use of dynamic lane merge control within construction zones; and
- Implementation of Active Traffic Management strategies (e.g., dynamic lane assignment and/or variable speed limits).

Arterials

- Enhanced traffic incident management programs and strategies;
- Installation and monitoring of vehicle sensors, and dissemination of resulting traffic information;
- Improved information dissemination via existing permanent DMS;
- Use of portable DMS to disseminate immediate information concerning NRC events; and
- Dynamic/adaptive traffic signal control that adjusts traffic control during NRC events.

PILOT PROJECT ON COUNTERMEASURES

The framework for a pilot project was developed to counteract NRC along the I-10 corridor in the West Valley. The pilot project is intended to work cooperatively with and build upon the work already done by the Traffic Incident Management (TIM) Coalition for this particular corridor. The framework for the pilot project will include the definition of the various TIM Focus Areas that include processes, activities, and protocols currently utilized by all agencies involved in any TIM activity along the I-10 corridor.

PROPOSED PARTICIPANTS	
DPS	
ADOT	Construction Maintenance Valley Project Management ALERT
MAG	
Maricopa County	Traffic Management Division REACH Medical Examiner's Office
City of Phoenix	Street Transportation Department Police & Fire Departments Public Transit Department Information Technology Services
City of Avondale	Traffic Engineering Division Police & Fire Departments Information Technology Department
City of Goodyear	Streets & Traffic Operations Police Traffic Unit Fire Department Information & Technology Services Dept.

Town of Buckeye	Public Works Department - Streets Police & Fire Departments Information Technology Department
Valley Metro RPTA	
FHWA	
Arizona Professional Towing & Recovery Association, Inc.	

Preliminary Scope Elements for the I-10 Corridor Pilot Project

The pilot project is envisioned as the initiation of a four-phased approach to refining traffic incident management along the study corridor. The focus of the pilot project will be to improve interagency communications, better accommodate driver decisions, influence driver decisions, and to improve traffic control during a non-recurring event. The following describes the proposed phases and what could be included in each:

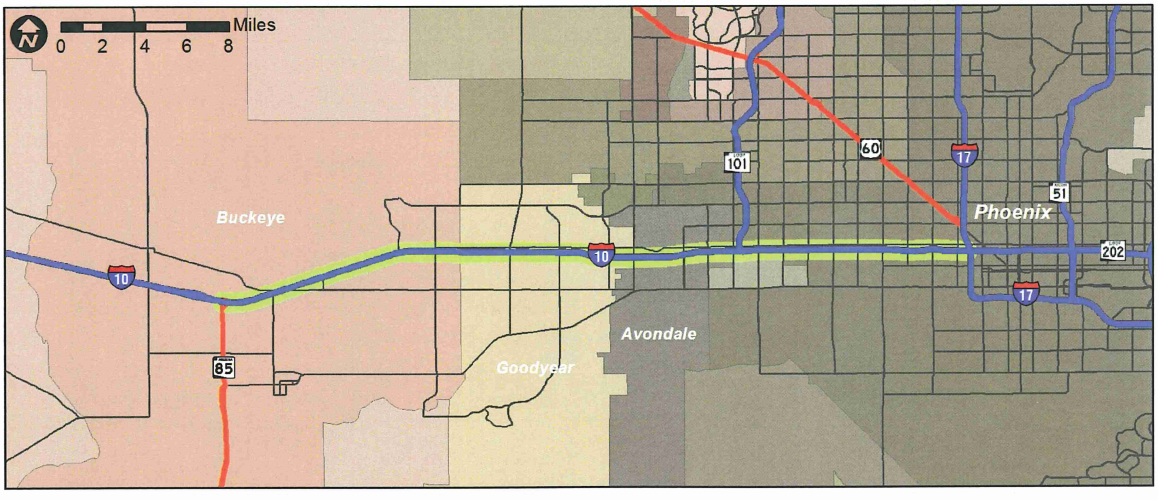
Phase 1 - Enhance Agency Communication and Coordination Process:
This phase will define who, how and when a corridor agency will be notified when a major incident blocks two or more lanes on I-10 and what the proper course of action by the various agencies is. It will make use of existing DMS signs with agreement of what messages are displayed under what lane closure scenarios. A unified process will be established for communicating with and providing updates to the media.

Phase 2 - Implement Arterial Street Signal Timing Strategies for Freeway Incidents:
The primary arterial streets to be considered are McDowell Road, Van Buren Street and MC 85. One concept is that is that McDowell will accept additional traffic in the event of westbound I-10 lane closure and Van Buren and MC 85 will accept additional traffic in the event of eastbound I-10 lane closure. The thinking behind that is that right turns will be made when departing the I-10 off-ramp which will accommodate more vehicles than if left turns are made. However, either case also requires left turns when the rerouted vehicles reach McDowell, Van Buren or MC 85. Special timing plans could be deployed to provide extra time at the intersections receiving the rerouted traffic and progression in the direction of the I-10 movement being accommodated. Although this is an initial concept, simulation modeling of this scenario as well as additional scenarios (such as both right and left turns from I-10 ramps and two-way progression on McDowell and Van Buren/MC 85) could be part of the second phase of the pilot project.

Phase 3 - Provide Infrastructure Improvements:
The need for infrastructure improvements will be identified, such as additional DMS or additional fiber-optic communications in the corridor, linking all agencies via the RCN. Another potential infrastructure improvement is CCTV at the intersections along McDowell Road, Van Buren Street and MC 85. This potentially will include communication from TMCs (both cities and ADOT) to traffic signals along the corridors needed to complete the deployment of special timing plans to accommodate extra diverted I-10 traffic when incidents occur.

Phase 4 - Potential New Methods and Technology:
This phase, if done, would result from information gained in phases 1 and 2. This would be an innovative approach to congestion management such as active traffic management. Strategies of active traffic management include variable speed limits, temporary shoulder use, junction control, and dynamic signing and rerouting.

A final step for the Pilot Project is the Evaluation Plan. The Evaluation Plan identifies the performance measures that should be analyzed to determine the success of the pilot project. The plan also identifies the types of data needed to assess the performance of the countermeasures.



PILOT PROJECT i-10 CORRIDOR MAP